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ABSTRACT

A modified form of vector analysis is examined that was applied to graphs depicting the number of undergraduate student credit hours taken by majors and nonmajors in each of 18 arts and sciences departments. The analysis permitted the identification of instructional service strategies adopted by various academic units and the evaluation of the impacts of curricular reform. Analyzing Induced Course Load Matrix (ICLM) data in this manner is claimed to reduce information overload and perceptual roadblocks to the use of ICLM data. It is concluded that changes in the instructional service function that have occurred across a four-year period within each department and differences in instructional service across departments during a single year can be more easily understood. Results are illustrated by graphs. (Author/SW)

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A Graphic Analysis of the Instructional Service Function of Academic Departments

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Running head: Analyzing the Instructional Service Function

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This paper was presented at the Twentieth Annual Forum of the Association for Institutional Research held at the Peachtree Plaza Hotel in Atlanta, Georgia, April 27 - May 1, 1980. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

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Abstract

A modified form of vector analysis was applied to graphs depicting the number of undergraduate student credit hours taken by majors and non-majors in each of eighteen arts and sciences departments. The analysis permitted the identification of instructional service strategies adopted by various academic units and the evaluation of the impacts of curricular reform. Analyzing Induced Course Load Matrix (ICLM) data in this manner reduces information overload and perceptual roadblocks to the use of ICLM data. Changes in the instructional service function, that have occurred across a four-year period within each department, and differences in instructional service across departments during a single year become more easily understood.

Key words: instructional service, induced course load matrix, academic departments

A Graphic Analysis of the Instructional Service Function of Academic Departments

Intensive interest in the functioning of academic departments within the university has emerged in the literature of higher education only within the last decade (Dressel, Johnson, & Marcus, 1970; McHenry & Associates, 1977).

In the past, higher education research, institutional research, and institutional self-study have generally been focused at the all-university level (Dressel & Associates, 1971). However, realization that the academic department or school is the primary unit of identification for faculty members and the primary organizational unit where policies are formulated and changes, if any, are implemented, has refocused analytical attention from the macro (all-university) level to the micro (departmental self-study) level (Dressel, Johnson, & Marcus, 1970; Faricy, 1974).

A product of the increased need for planning in higher education has been the development of increasingly sophisticated systems for analyzing and costing university programs (Haight & Martin, 1975a). One of the most widely adopted planning tools in recent years has been the Induced Course Load Matrix (ICLM), which has great flexibility and potential for developing insights with regard to interrelationships among programs offered by various academic units within the university (Haight & Martin, 1975b; Suslow, 1976).

The ultimate test of the value of such management tools is the degree to which they are usable at the most decentralized level possible, i.e., the school or department. In this regard, the work of Huff and Young (1974) is useful but very general in nature. The need is to transform raw data into information which can be communicated at the school or departmental level (Balderston, 1974, pp. 230-231). However, the literature is extremely limited in this area (Lawrence & Service, 1977).

The need to facilitate communication at all levels and among all units of the university has been a major concern of institutional researchers, deans, and department heads for some time (Wright, 1970). At the same time, the disciplinary perspectives of persons interested in developing analytical information about school and departmental functions has grown to include both operations research specialists (Hill & Judd, 1973) and systems analysts (Thomas, 1975). While the varying backgrounds of individuals involved in analytical activities has added a great deal of diversity, it has also created inevitable problems in communicating and interpreting ICLM data to deans and department heads who do not share a common disciplinary perspective (Patterson & Minahan, 1977). A consequence of the inability to communicate meaningful data to a diverse group of decision makers is that "much of these data are not converted into policy relevant information but remain incarcerated by computer or data processing equipment" (Fincher, 1977).

The ICLM produces data which can be used for a wide variety of purposes including description of programs and projections of enrollments in various program areas. At a time of changed and changing curricular requirements, the ICLM is valuable in providing a portrait of what constitutes a given major program of study at the particular time. ICLM is also often used as a basic element in the costing of programs by degree and disciplinary areas.

Institutions in initial stages of becoming familiar with the ICLM are often inclined to view the resulting data for a single semester as definitive. Administrators who choose to regard quantitative institutional data as if they were analogous to the results of a highly controlled experiment in physics do so at their peril as professional planners. When viewed longitudinally, rather than as a single semester "snapshot," the construction of an historical ICLM enables an institution to develop equations which allow it to predict enrollments in various programs and majors (Kieft, 1977). The ability to move from description to prediction means that the ICLM can indeed be a most important planning tool.

In practice, the utility of ICLM data as a planning tool has meant that it is often used as a cornerstone to arrive at estimates of unit costs of instruction by major and level. The state-level pressures to use the ICLM as a planning tool for the purpose of developing comparable cost data are all too obvious. As of Fall 1979, some 20 to 25 states have moved or are moving to

largely mandatory implementation of National Center for Higher Education Management Systems (NCHEMS) Information Exchange Procedures. The rush to implement NCHEMS products aimed at producing costing data for planning purposes has meant that institutions have in many instances paid very little attention to the analytical capabilities of the ICLM.

One of the most useful ways of looking at ICLM data is with regard to examining the instructional service functions of academic schools and departments. This paper is limited to examining the instructional service function of university departments through the use of the ICLM.

In his evaluation of current knowledge about departments with suggestions about needed research, Peterson (1976) notes that "The service function is virtually unexamined" (p. 29). Miyataki and Byers (1976), in their NCHEMS Academic Unit Planning and Management and Byers and Bower (1975) in the NCHEMS document IEP Analysis and Use: Single Institution Data, provide a number of sample data arrays which make the ICLM data more useful for internal planning purposes but neither report deals with the instructional service function per se.

In another paper, several areas were suggested for future institutional research by Miyataki and Gray (1975). In this regard, the authors noted two suggested areas for research (p. 20) which are addressed in some detail in this paper.

1. Information for and about departments. The concern here is to identify and implement ways to improve the communication among the various administrative levels (i.e., enabling all administrators to be able to "tell their story").

2. "Servicing" functions of departments. Administrators are becoming increasingly concerned with the costs of providing instructional courses to students from other departments as well as ways to increase the number of their own students. In other words, there is need to understand the implications of "program" and department interrelationships.

This paper is directly in line with the research needs identified by Miyataki and Gray in that the purpose is to show how data derived from the Induced Course Load Matrix with regard to the instructional service function of academic departments may be partitioned, aggregated, and displayed in a particularly informative way by graphing student credit hours offered to majors and non-majors. By this means an administrator can gain a more definitive perception of the instructional service roles performed by each department across time and similarities and differences among several departments with regard to instructional loads for majors and non-majors may be readily discerned.

Analysis

In our initial attempt to analyze departmental instructional service, we looked at the ratio of the number of undergraduate

student credit hours (SCH) given to the majors of a department relative to the number of SCH's to all non-majors. Calculated ratios, however, are spuriously affected by a very small amount of absolute change when the base numbers are very small. Inasmuch as our base data (SCH to non-majors) ranged as low as 27 SCH's for one department to as high as 5000 SCH's for another, we felt the need for an alternative approach to that measure of instructional service. The alternative we chose consisted of plotting the number of SCH given to non-majors on the horizontal axis of a graph against the number of SCH given to majors on the vertical axis. In this manner, the changes in this relationship which occur across time can be viewed in the context of the value of the base numbers themselves, since the ratio of SCH's to majors relative to non-majors is indicated by the slope of the line running from the origin of the graph through the plotted point. Beyond the demonstration of a technique for the presentation of SCH data that circumvents the problems with calculated ratios, the major purpose is to show how additional valuable information regarding changes of emphasis and/or overall level of service is made readily available when instructional service is presented in this particular way.

Measures Utilized

The SCH to majors and SCH to non-majors mentioned above are used directly as two independent measures of instructional service. Two additional measures were derived from these two by

(a) summing them, and by (b) plotting SCH's to majors relative to SCH to non-majors as described above. The latter measure is hereafter referred to as "relative service function."

1. The relative service function of an academic department can, of course, vary from one semester (T_1) to another (T_2), noted in illustrative Figure 1; the combined total of the SCH's may or may not remain constant. In Figure 1, point T_2 represents a change in relative service function from the point T_1, but the total service (combined sum of SCH to majors and non-majors) remains constant from T_1 to T_2 because a compensatory increase in SCH to majors offsets the decreased SCH to non-majors. Point T_3 represents a change in relative service function from T_1 in which there is a concomitant change in the total service of the department. This particular example (T_3) depicts a situation in which, although the service to non-majors decreased considerably, the amount of service to majors remained constant.

2. The total service of an academic department (the combined) sum of the SCH to majors and the SCH to non-majors) can, of course, vary from one semester to another without a concomitant change in relative service function (slope) as is shown in Figure 1 (T_1 to T_4). However, the relative service function may also change, as has been noted in this figure from T_1 to T_3.

3. The SCH to majors may vary from one semester to another with or without a concomitant change in relative service function or total service. In Figure 1, point T_4 represents a change

from T_1 in SCH given to majors with the relative service function (slope) remaining constant because of a proportional change in SCH to non-majors. T_2 represents a change (increase) in SCH to majors from T_1 without a change in total service because the SCH to non-majors changed (decreased) by a corresponding amount.

4. The SCH to non-majors can vary from one semester to another with or without a concomitant change in relative service function or total service. In Figure 1, point T_4 represents a change (decrease) from T_1 in SCH to non-majors with no change in the relative service function (slope) because of a proportional change (decrease) in SCH to majors. Point T_2 represents the same decrease in SCH to non-majors from point T_1, but here there is no change in total service from T_1 because of an equal and opposite increase in SCH to majors.

Insert Figure 1 Here

Invariance in One Measure

If SCH to either majors or non-majors change, both of the derivative measures will change as well (i.e., total service and relative service function). Even if the SCH to majors and to non-majors both change in such a manner that the relative service function will not change, total service will, of course, be changed. Furthermore, if the SCH to majors and non-majors change reciprocally in such a way that the total remains the same, the relative service function will change. Therefore, any change

in SCH leaves, at most, only one measure unchanged. Those instances in which one measure does remain relatively invariant permit the most unequivocal identification of the changes in the instructional service of a department that may have accompanied changes in academic policy, curriculum development, academic and vocational preference of student population, etc. Plotting the data in the manner described makes this invariance more salient.

In describing the situations that might lead to changes in three measures while leaving the other measure invariant, we will also indicate the parameters of the graph that correspond to each of these hypothetical situations:

1. No change in relative service function. If it is simply known that there has been an overall change in the total enrollment of a particular school or college with no basic change in curriculum requirements and no major change in departmental offerings, the expectation would be that all the departments had proportionally changed their total of student credit hours. At the level of departmental instructional service, this would result in no change in the relative service function with the other three measures all changing in the same direction (increasing or decreasing). A graphic portrayal of this situation would put the point reflecting a decrease (T_4) on a line extending from the origin of the graph through the first plotted point corresponding to the earlier data (T_1) as is the case in Figure 1. Conversely, if there were simply an overall increase in enrollment, the corresponding

data point would lie further than T_1 from the origin along the same line.

2. No change in total service (T_1 and T_2 in Figure 1). It is possible for a department to shift its curricular priorities in such a way so as to change the ratio of service to its own majors relative to service to non-majors. This situation would be revealed in a graphic portrayal by the second point (T_2) falling on a diagonal line connecting the numbers on the axes that correspond to the total SCH, running through point T_1 as is the case in Figure 1. Such a diagonal would not only contain points T_1 and T_2, but all such points representing SCH to majors and non-majors that have this same combined total. The kind of change we have described here results in no change in total service. However, it does produce changes in SCH to majors, SCH to non-majors, and the relative service function.

3. No change in SCH to majors (T_1 and T_3 in Figure 1). If a department has added or discontinued one or more courses of general interest, this may change instructional service to non-majors with no change in SCH to majors. This will be evident in a graphic portrayal in that the second plotted point will lie along a line running through the earlier point parallel with the horizontal axis as is the case with points T_1 and T_3 in Figure 1. In such a case there has been no change in SCH to majors, but a change in SCH to non-majors and a corresponding change in total service as well as a change in relative service function.

4. No change in SCH to non-majors (T_2 and T_3 in Figure 1). If for some reason there is a change in the number of students majoring in a particular department with no change in SCH to non-majors, then the second plotted point in a graphic portrayal will fall along a line running vertically through the first point. Such a relationship is between points T_2 and T_3 in Figure 1. The vertical line extending through these points intersects the horizontal axis at the point at which the instructional service to non-majors is held constant, and will contain all points corresponding to possible values of student credit hours to majors. In addition to the change in SCH to majors, and in the relative service function, there is, of course, also a change in the total service.

Application of Method to Comparison of Same Department Across Different Semesters, Fall 1973 and Fall 1976

Figure 2A contains a set of points for the departments in the College of Arts and Sciences for two points in time: Fall 1973 and Fall 1976. The two points are connected by an arrow pointing from the data point for 1973 (T_1) to the data point for 1976 (T_2). A comparison of the same department across these two different points in time requires that the observer analyze change in terms of movement on the graph in each of four basic directions: radially, diagonally, horizontally, and vertically. It is helpful to inspect all departments for only one kind of change before

looking for another kind of change. To facilitate this sequential analysis, appropriate lines can be drawn across the graph on which the points are plotted, as we have done separately in Figures 2B through 2C and 3B through 3C, or the task can be facilitated by the use of translucent lines on separate overlays which can be laid singly or in various combinations across the plotted points. The latter method was originally utilized in presenting the data at a meeting of academic department heads. However, publication constraints necessitated the kinds of lines presented herein.

Although it may seem unlikely that a department would change across time in only one direction, this was the case in 10 of the 15 departments in the College of Arts and Sciences for which we have definitive data for the Fall 1973 and Fall 1976 semesters. A description of the kind of change detected on the graphs follows:

1. Stable relative service function (no change in ratio of SCH to majors relative to non-majors). In Figure 2B, utilizing the lines projecting radially from the origin we see that the Department of Drama/Speech maintains the same mix of instructional service across the three-year period. This is also true for the Department of Psychology. The points moved <u>outward</u> along this radial line, indicating that they also experienced an overall increase in total combined SCH. It will also be evident in this figure that the Department of Art also maintained the same kind of instructional service across the three-year period. However,

it will be seen that the point corresponding to Art moved inward along the radial line toward the origin indicating a decrease in the overall sum of SCH produced.

2. No change in total service. Examination of Figure 2B utilizing the diagonal lines reveals that there was little or no change in the total number of SCH given by the Departments of History, Romance Languages, Geography, and German and Russian across this three-year period. The fact that these points moved downward along the diagonal indicates that there were corresponding increases in SCH to non-majors offsetting the decrease in SCH to majors.

3. No change in SCH to majors. Examination of Figure 2C, utilizing the horizontal lines, reveals that the Departments of Math, Physics, Chemistry, and Philosophy maintain consistency in their service to their majors across this three-year period, while changing in the amount of service to non-majors. Math, Physics, and Chemistry increased their service to non-majors as is indicated by the point moving to the right along the horizontal line. The Department of Philosophy decreased its service to non-majors as is indicated by the point moving to the left along the horizontal line.

4. No change in SCH to non-majors. Examination of Figure 2C, utilizing the vertical lines, reveals that the Department of Biology did not change in the total number of student credit hours given to non-majors across the period 1973-1976. Inasmuch as

their point moves upward along this vertical line, the Department of Biology concomitantly increased the number of student credit hours to their own majors during this time.

Insert Figures 2A, 2B, and 2C here

Comparison Across Different Departments During the Same Semester, Fall 1976

The preceding discussion has shown how plotting instructional service for a number of individual departments across time does permit one to discern invariance as well as change in the instructional service function in the same department from one time to another. This same method of analysis also aids in the detection of important similarities and differences in the instructional service function among the different departments within a single time frame. Similarities among departments in regard to each of the four measures of instructional service are noted below:

1. Same relative service function. Examination of Figure 3A, utilizing the radiating lines, reveals that the Departments of Political Science, Biology, and Psychology offered a similar kind of instructional mix to majors and non-majors during the Fall of 1976 inasmuch as the data points for each of these departments fall very closely along the same line radiating from the origin of the graph. The Departments of German and Russian, Geography, Chemistry, and Mathematics also fall approximately on

the same line. These departments fall along a line having a lesser slope than do the former departments, indicating that their relative service function is oriented more toward service to non-majors than is the case with Political Science, Biology, and Psychology. Even more oriented toward service to non-majors are the Departments of Classical Civilization, Philosophy, Religious Studies, Anthropology, Physics, and Romance Languages, all of which seem to fall along the same radial line coming from the origin at an even lesser slope. One can rank order departments in terms of relative service function by observing the slope of the line connecting the departmental data points to the origin of the graph in Figure 3A.

2. Same total service. Utilizing the diagonal lines of Figure 3A reveals that the Departments of Art and Biology have about the same total combined student credit hours as their points fall very near the same diagonal line. Although they do not offer as many total hours of instruction, the Departments of History and Drama/Speech are very nearly equal to each other as are the Departments of Political Science and Physics. The Departments of Geography and Philosophy appear to be about equal to each other in total student credit hours produced, while the Departments of German and Russian and Classical Civilization are also quite comparable in this regard.

3. Same service to majors. Utilizing the horizontal lines of Figure 3C reveals that the Departments of Sociology,[1] Biology,

Psychology, and English have produced about the same total SCH for their own majors because they fall along the same horizontal line. Although they offer fewer hours of instruction to their majors, Political Science and Chemistry have about the same service to majors. The Departments of German and Russian, Geography, Anthropology, and Physics are quite similar to each other as are the Departments of Classical Civilization, Philosophy, and Religious Studies. One can rank order departments in terms of service to majors from high to low by observing the departmental data points relative to the horizontal lines in Figure 3B.

4. Same service to non-majors. Examination of Figure 3B, utilizing the vertical lines, reveals that the Departments of English and Math offer roughly the same number of SCH to non-majors as they fall near the same vertical line. The same is true of the Departments of Biology and Psychology, the Departments of Sociology and History, the Departments of Drama/Speech, Chemistry, and Physics, the Departments of Political Science, Anthropology, and Religious Studies,[2] and the Departments of German and Russian, Classical Civilization, Geography, and Philosophy. One can rank order departments in terms of service to non-majors from high to low by observing the departmental data points relative to the vertical lines in Figure 3C.

Insert Figures 3A and 3B here

Discussion

We believe the rationale and technique for examining the instructional service loads of academic departments or schools as discussed herein to be particularly useful for three primary reasons. First of all, we find the technique of presenting data in a graphic format to be an aid in solving the problem of information overload. Second, we find the examination of changing patterns of instructional service loads over time to be of considerable value in analyzing basic changes in the instructional role of various academic units which might not be readily detected through other means. Whether such changes are the result of uncontrolled events or consciously adopted strategies should be of considerable interest as well. Finally, the examination of the instructional service aspect of academic departments and the techniques demonstrated in this paper seem to be of some heuristic value in that they raise a number of fundamental questions about the purposes (and/or goals) of academic departments and schools which should be the subject of further research.

Communication of Data

Perhaps the greatest problem inherent in presenting Induced Course Load Matrix data is its sheer volume. In this regard, the problem of presenting data to academic deans and department heads directly through one or more of the very detailed print options afforded by the ICLM requires a number of decisions which may be

based upon inaccurate assumptions about the manner in which data are perceived by deans and department heads with varying disciplinary perspectives. It must be recognized that administrators coming from various academic backgrounds perceive quantitative data in very different ways. Within the College of Arts and Sciences alone, much less the larger university, the degree of familiarity with quantitative data by the artist, chemist, historian, psychologist, and/or physicist is quite different.

Apart from the issue of bias against or propensity for quantitative data, the sheer volume of ICLM data and the concomitant time required to master the potentially overwhelming detail requires that further attention be given to synthesizing and putting ICLM information into a more succinct form. From this standpoint, we believe that the technique of presenting ICLM data used here addresses the information overload and perceptual roadblock problems and serves both as an attention getter and summarizing device.

Tables derived from these graphs showing ordinal relationships among departments with regard to service to majors, service to non-majors, relative service function, and total service function might be more helpful to those unfamiliar with graphic displays. Alternative means of presenting graphic data including the reformating of tabular data or the reprogramming of ICLM output as has been done by Patterson and Minahan (1977) also need to be considered. Further research on more effective methods of presenting quantitative data which would encourage the use and acceptance

of such data in decision making is clearly needed (Diran, 1978; Dressel & Simon, 1976; Wyatt & Zeckhauser, 1975).

Identification of Service Strategies

Figures 2A through 2C indicate changes in relative service function from Fall 1973 to Fall 1976. The ability to observe changes in relative service functions which are indicative of alterations in the functions performed by academic units over time is valuable in several respects. A single year's data may be unreliable in the same manner that any snapshot may be atypical. If institutional research may be regarded as an attempt to "stamp out unattached figures," the addition of another data point further increases the utility of the data by broadening the perspective in which departmental functions are examined. As suggested previously, a key question which emerges in this regard is whether dramatic shifts that are produced in any of these four measures of instructional service are the result of uncontrolled events or the conscious adoption of instructional service strategies. However, the possibility always exists that the effects of conscious strategies are cancelled by variables which operate in opposite directions. Thus, the appearance of simply "holding the line" in producing total student credit hours in an Arts and Sciences Department in the context of overall decreases in SCH produced in the liberal arts may, in fact, be the result of deliberate strategies for generating SCH. For example, History and Romance Languages

have maintained approximately the same total SCH although SCH to majors in these disciplines have decreased during this period. This has been accomplished by expanding the range of offerings to non-majors. Plotting the data in the manner we have described helps to make this simple kind of compensatory interaction more obvious than it would otherwise be.

If one were to extend the analysis noted herein to include examination of the relative service function of professional schools, one might expect almost all of the professional schools to have relative service functions more oriented toward their own students than are the departments of the College of Arts and Sciences. A School of Health, Physical Education and Recreation might serve as an exception because of the general presence of university-wide physical education requirements. Some Arts and Science departments might be expected to approximate the relative service function of professional schools. Examples would include the Departments of Art and Drama/Speech which contain substantial "professional" components in their prescribed curricula.

Other questions of some interest regarding the instructional service function of academic units are:

1. How do academic units which differ in the relative service function differ with regard to other factors such as (a) relative emphasis upon undergraduate education, graduate education or research, (b) extent and type of interrelation with other academic units in the university, (c) orientation of faculty

members to the department, university, or discipline, (d) size of department, and (e) percentage of funds derived from external sources?

2. When the relative service function of a department changes substantially, what are the implications for changes in teaching loads, academic advising loads, faculty development, or curriculum design?

3. How do non-personnel instructional support costs vary among departments with high or low relative instructional service functions? It might be hypothesized that the greater the emphasis is on service to majors (as opposed to non-majors), the higher the support costs because of the need to provide specialized facilities or equipment. This relationship may differ greatly across disciplines but should be considered when non-personnel funds for instructional support are allocated.

4. Do the patterns of faculty ranks within the departments reflect the relative service function? One might expect that a department with a greater emphasis on service to non-majors would be able to utilize a greater proportion of faculty in the lower ranks and advanced graduate students in the instruction of these lower-level non-specialized courses. However, this may not always be the case due to the decreased mobility of faculty and tenuring-in of increasingly higher percentages of faculty. Nevertheless, the possibility of bringing about such a correspondence of faculty and relative service function should be considered as staffing plans are developed for schools and departments.

5. Inasmuch as changes in the relative service function observed herein are over a relatively brief period, similar analyses should be continued for more extended periods of time to determine if anticipated or unanticipated changes in program emphasis effect discernible changes in relative service functions. This would also provide the opportunity for checking on the consistency of trends noted over the four-year period of observation reported here.

6. Concerted efforts should be made to evaluate the effects of communicating ICLM and other types of administrative data to deans and department heads in graphic, tabular and other formats. One might assume that administrators with varying disciplinary backgrounds would prefer to have data presented in varied formats. It is hoped that further research would lead to the development of more effective strategies for communicating institutional research data to diverse audiences.

The ultimate value of this easily replicated method of analyses of the relative service function of academic departments derived from ICLM data may be judged by the extent to which administrators are aided in recognizing similarities and differences among academic units with regard to various aspects of instructional service, and the extent to which these insights are converted into policy relevant information. The value of the graphic analyses of the relative service function of academic departments

may also be judged by the extent to which related questions about the basic functioning of academic schools and departments are raised and illuminated.

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Footnotes

[1]The Departments of Sociology and Anthropology were combined in Figures 2A through 2C because they were not separate departments in 1973. Consequently, the data for 1976 had to be combined for comparison with the earlier data of 1973 although they were administratively separate by that time. Figures 3A through 3C do show Sociology and Anthropology separately for 1976, of course, permitting separate comparisons with each other and other departments of the College of Arts and Sciences for the Fall of 1976.

[2]The Department of Religious Studies appears only on Figures 3A through 3C (and not Figures 2A through 2C) because there was no Department of Religious Studies in 1973.

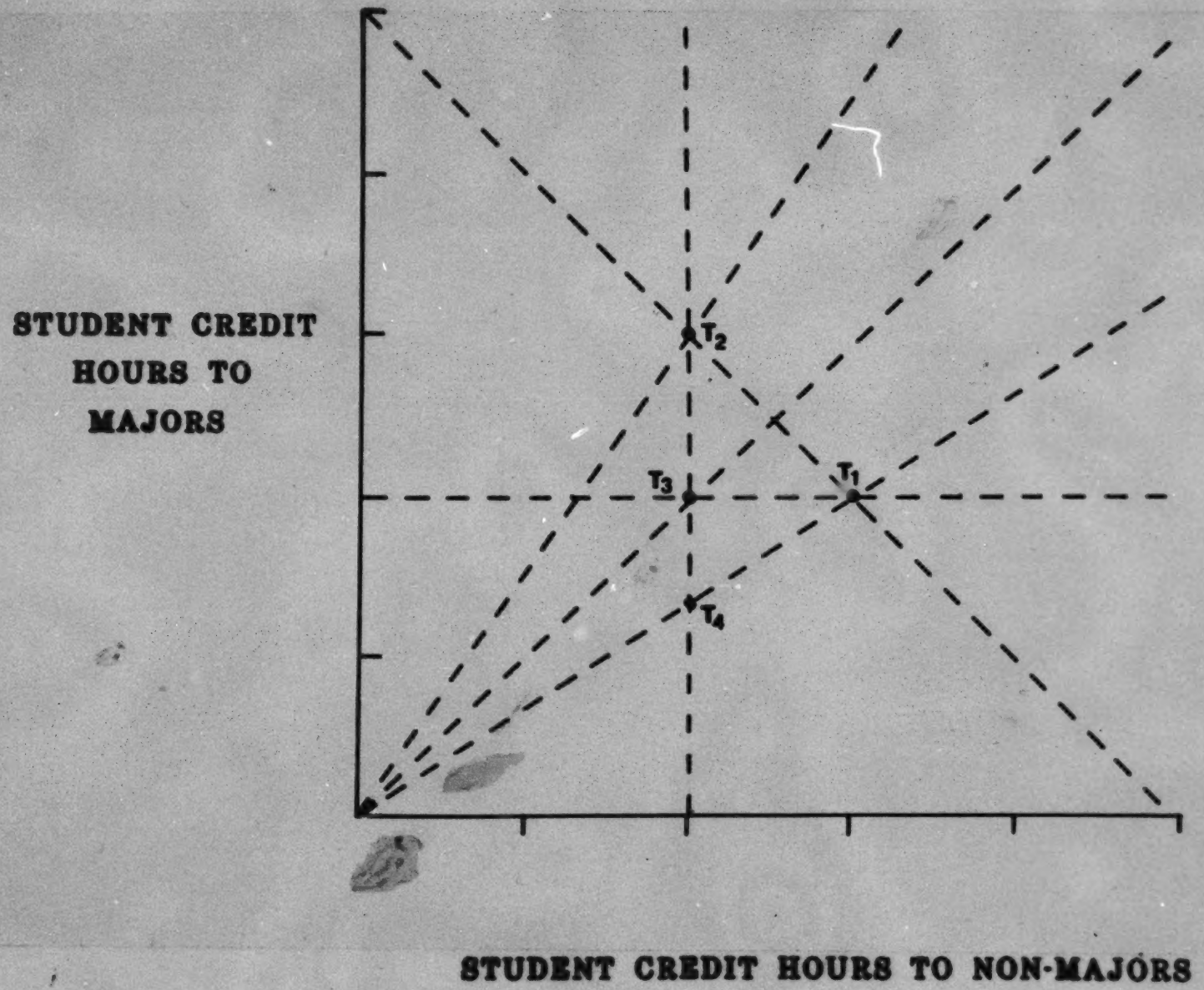

Figure 1. Changes in instructional service across time.

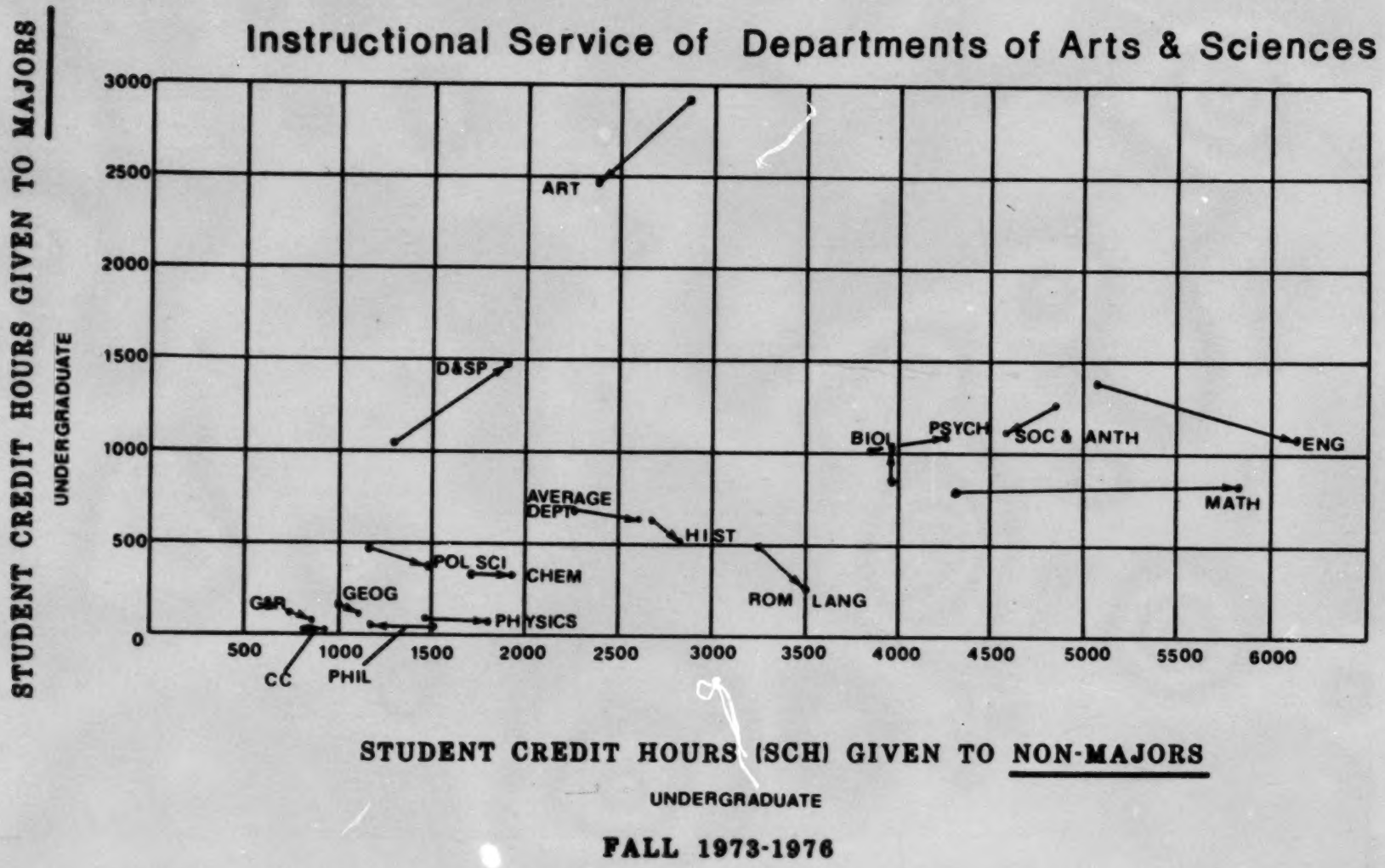

Figure 2A. Changes in instructional service in Arts and Sciences Departments from Fall 1973 to Fall 1976 semesters.

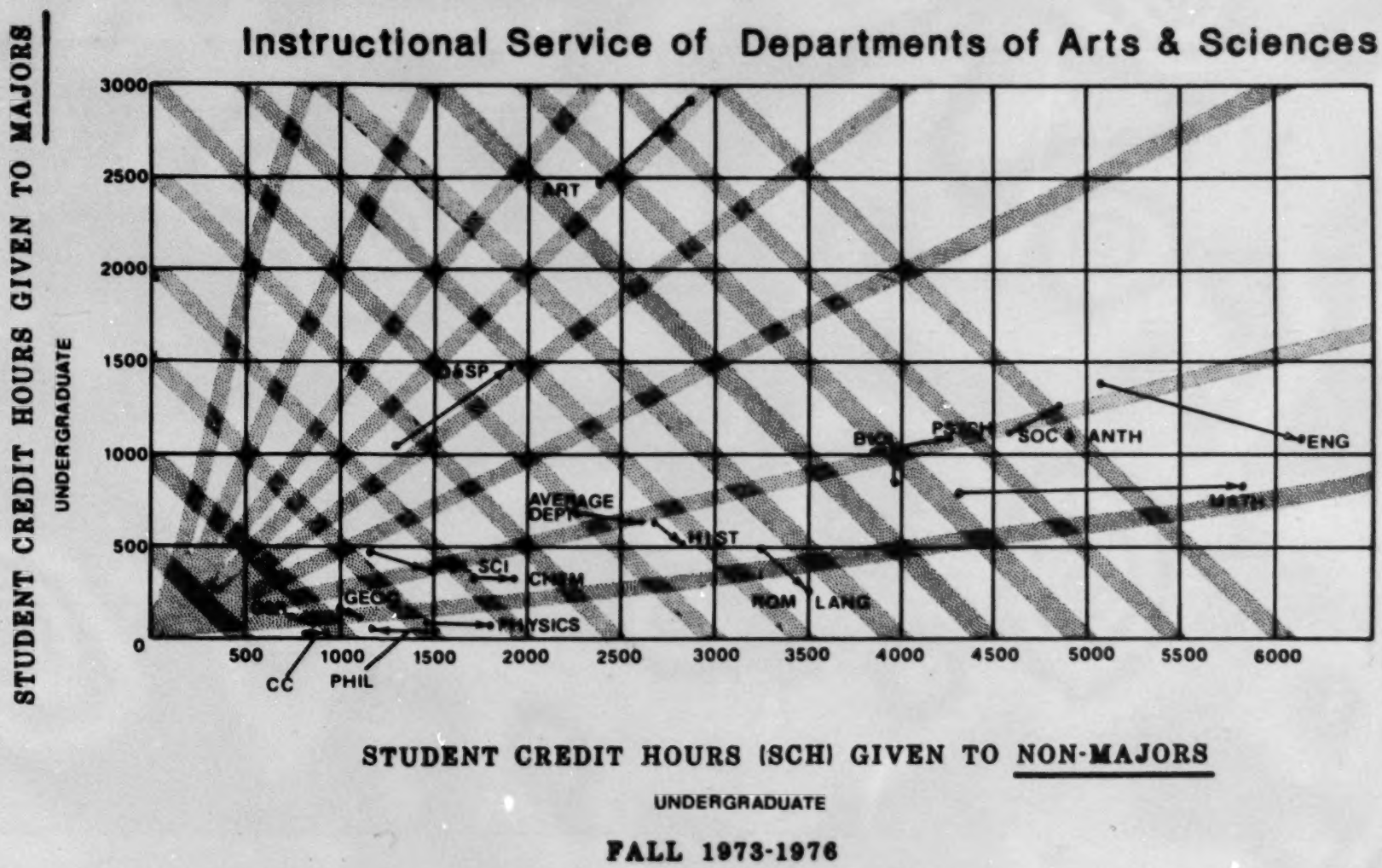

Figure 2B. Changes in instructional service in Arts and Sciences Departments from Fall 1973 to Fall 1976 Semesters.[a]

[a]A point moving along a radial line indicates no change in relative service function. A point moving along a diagonal line indicates no change in total service.

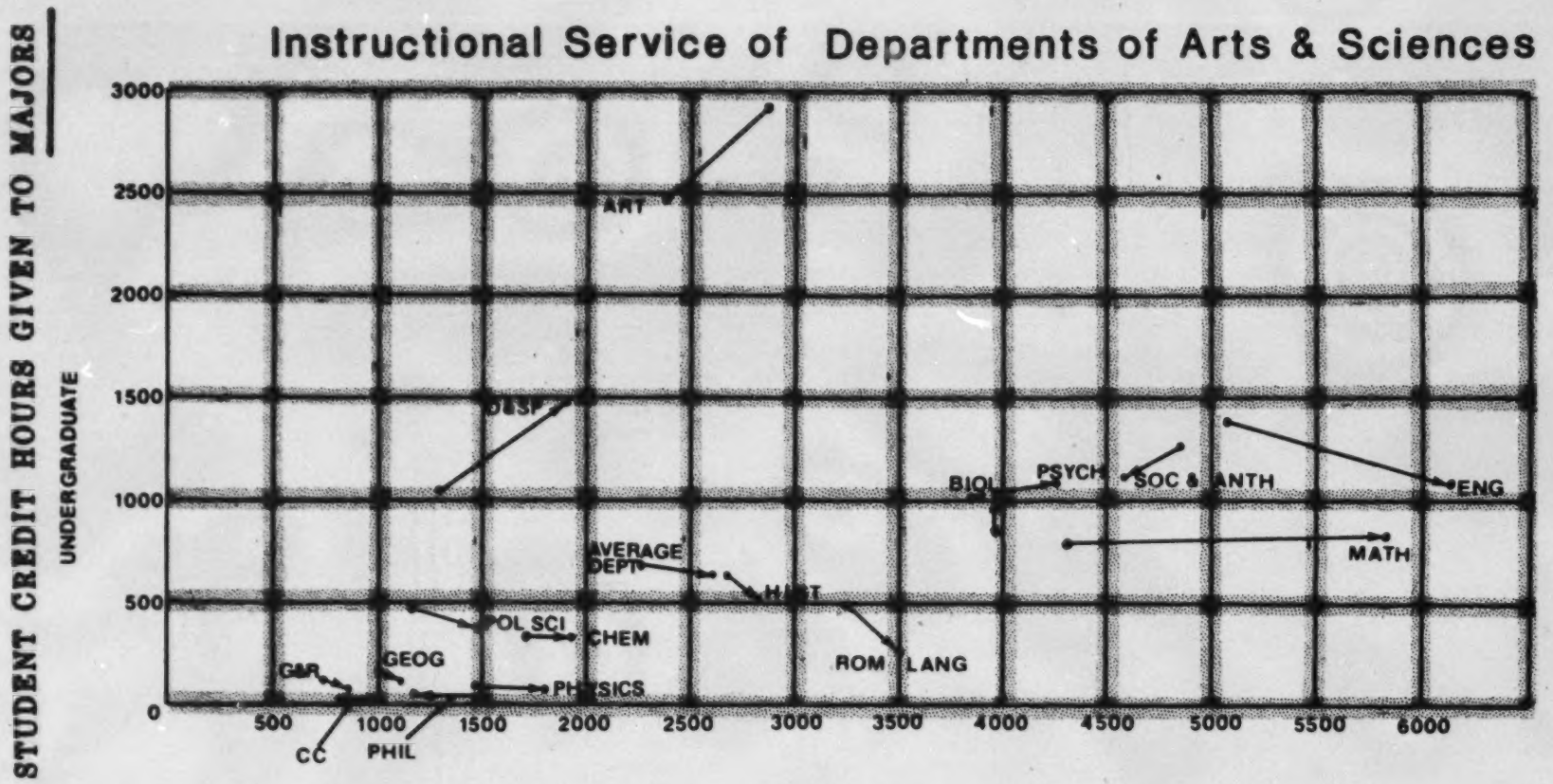

Figure 2C. Changes in instructional service in Arts and Sciences Departments from Fall 1973 to Fall 1976 semesters.[a]

[a]A point moving along a vertical line indicates no change in service to majors.

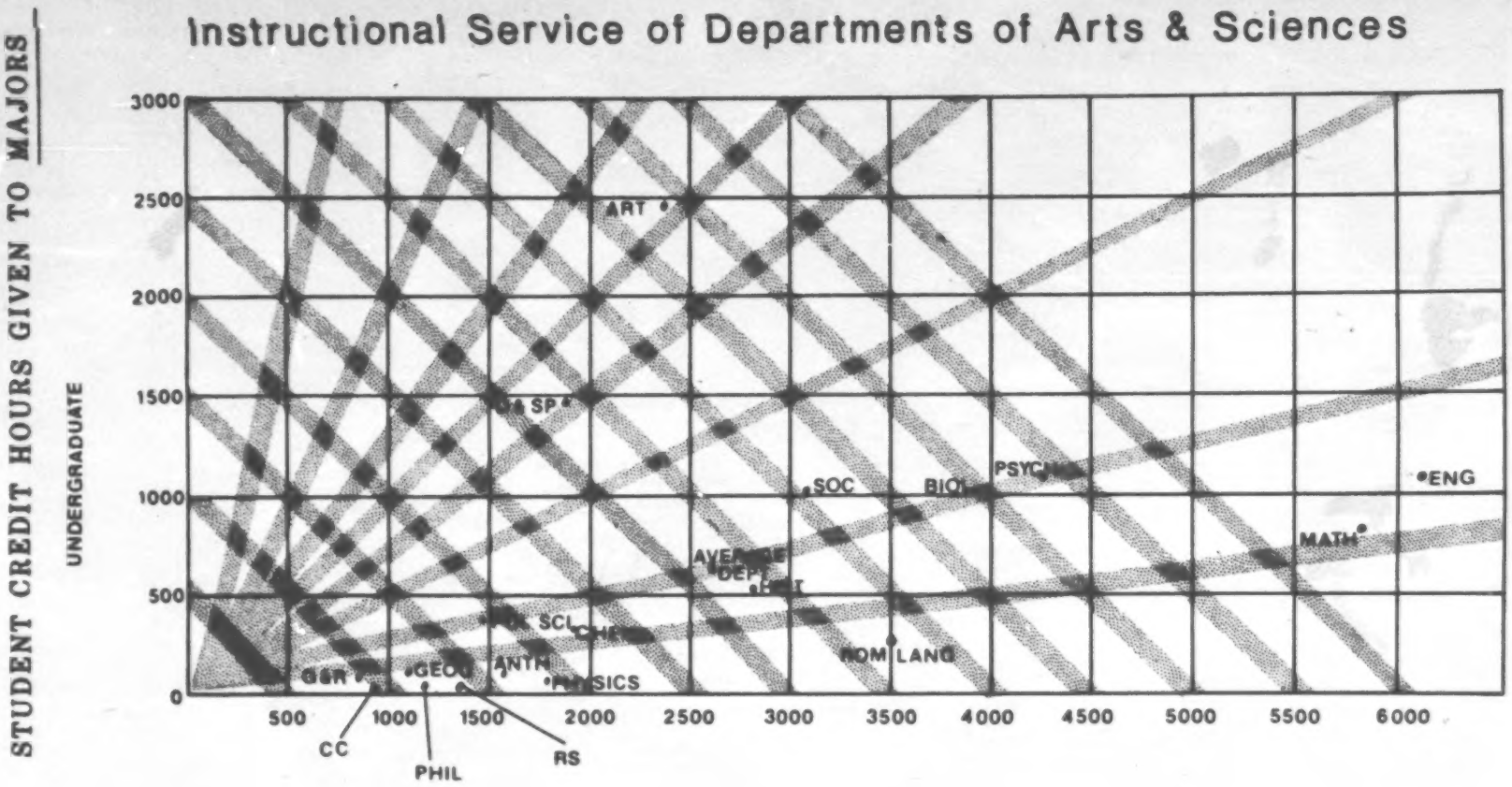

Figure 3A. Instructional service in Departments of Arts and Sciences, Fall 1976 semesters.[a]

[a]Points falling on the same radial line indicate the same relative service function. Points falling on the same diagonal line indicate the same total service.

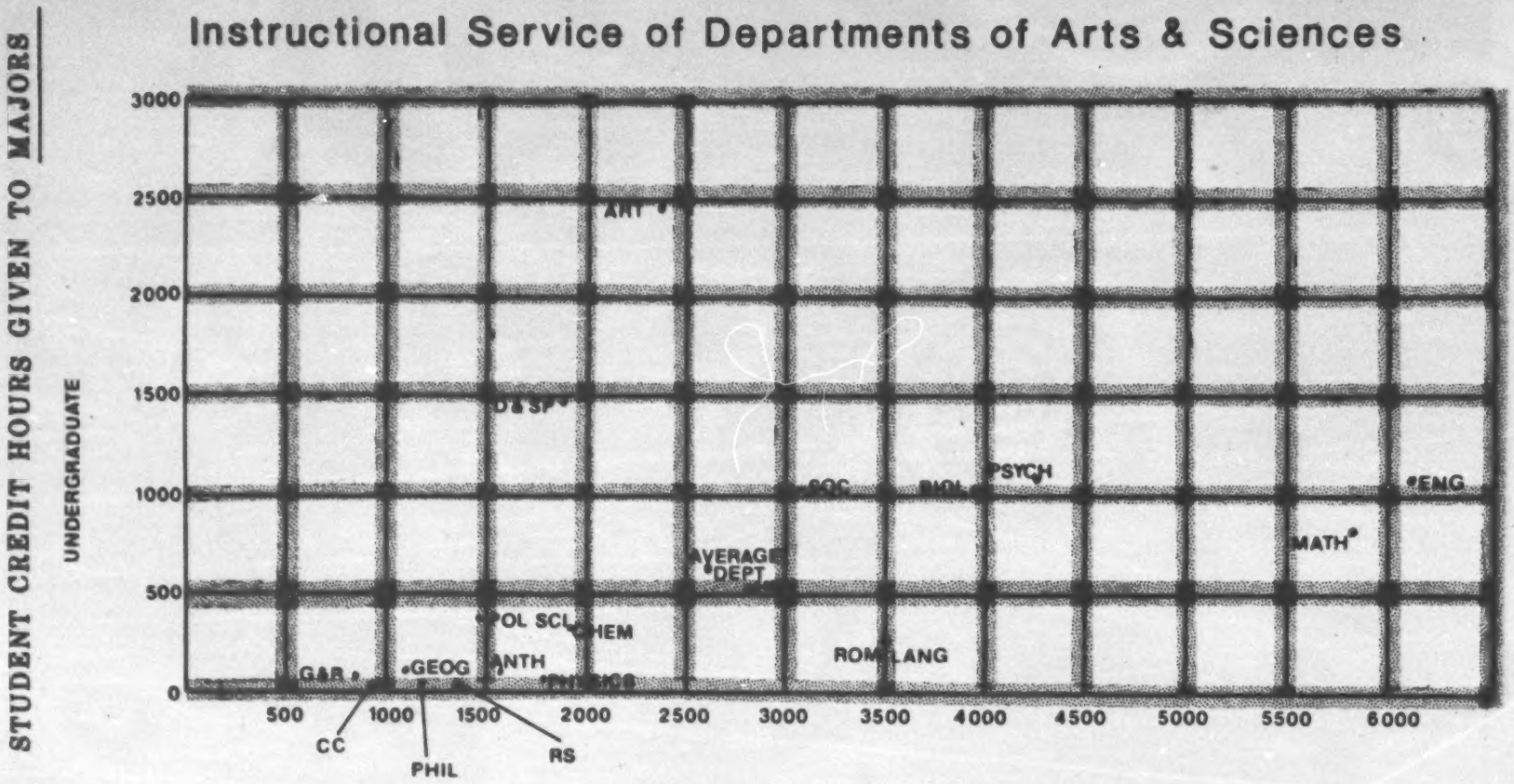

Figure 3B. Instructional service in Departments of Arts and Sciences, Fall 1976 semester.[a]

[a]Points falling on the same vertical line indicate the same service to non-majors. Points falling on the same horizontal line indicate the same service to majors.